SWRHL-80r

MANAGEMENT HISTORY OF THE AEC BEEF HERD

1 JUNE 1964 - 1 JUNE 1969

by
Donald D. Smith, D.V.M.
Radiological Research
Southwestern Radiological Health Laboratory

U.S. Department of Health, Education and Welfare
Public Health Service
Environmental Health Service
Environmental Control Administration
Bureau of Radiological Health

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ABSTRACT

From June 1, 1964 to June 1, 1969, the Atomic Energy Commission's (AEC) beef herd has been maintained on the Nevada Test Site (NTS) by the Public Health Service's Southwestern Radiological Health Laboratory (SWRHL). The herd is used to determine the uptake and retention of various radionuclides and to provide background information regarding various inquiries and possible legal claims from off-site ranchers. This report covers the history, animal husbandry, production and sampling program for the herd during the last five years that it has been managed by the SWRHL.

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I. INTRODUCTION

In the spring of 1956, the Assistant Manager for Test Operations, Albuquerque Operations Office, U. S. Atomic Energy Commission authorized the formation of the AEC beef herd to be grazed on the Nevada Test Site as a part of the Off-Site Animal Investigation Project. This project was under the direction of an Army veterinarian who was assigned this detail by the Division of Military Application. On June 1, 1964, the Nevada Operations Office, AEC, transferred responsibility for the project and beef herd to the Southwestern Radiological Health Laboratory (SWRHL). This report covers the management and animal husbandry of the herd from June 1, 1964 to June 1, 1969.

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II. HISTORY

The beef herd was originally established to enhance relationships between NTS Operations and off-site ranchers through an investigative project of mutual interest. Of more importance, however, is the collection and documentation of data concerning the uptake and retention of radionuclides in the tissues of these animals. The management records and analytical results are used as background information during investigation of various claims, complaints, and inquiries arising among livestock raisers, wildlife management personnel, and other groups concerned with animal welfare.

The original herd consisted of 42 grade Hereford cattle, (14 cows, 14 yearlings, and 14 calves) purchased in October of 1957. In June of 1958 a Hereford bull was purchased and in September 1958 ten more grade Herefords (3 cows, 4 two-year-old heifers, and 3 calves) were added to the herd. All cows were purchased from local ranchers within 30 miles of the NTS. With the exception of annual additions of replacement herd sires, no new cattle have been introduced to the herd since 1958.

Prior to 1965 the herd was grazed on Bald Mountain in the summer months and spent the fall, winter, and spring months on Frenchman Flats, Yucca Flats, Papoose Lake, or a combination of the three areas. A semiannual sampling program was conducted in which five animals were sacrificed each May and November. At each sacrifice a mature cow, a three-year-old, a two-year-old, a yearling, and a calf were selected. Details of the animals husbandry, sacrificing program and analytical results for the period 1957-1961 have been published.[1]

III. BEEF HERD MANAGEMENT

A. Animal Husbandry

When the SWRHL assumed management responsibility, the herd consisted of 87 animals which were grazing on Yucca Flat. As range conditions were poor and the cattle were often a traffic hazard, they were moved to the Well 3 corrals while a new grazing area was located.

In order to have a more manageable herd 44 animals were declared surplus and transferred to the University of Nevada at Reno on October 8, 1964. On February 7, 1968, the remainder of the herd was moved to Area 18 where they and their descendents have remained ever since. The herd now consists of 33 mature cows, 2 bulls, 8 mature steers, 26 yearling animals and 32 calves. A complete census of the herd is presented in Appendix I.

The Area 18 range consists of over 13,000 acres and has six major plant communities which furnish food for the cattle.(2) The six plant communities are: Black sagebrush; big sagebrush; desert shrub; grass; Russian thistle; and buckwheat. The cattle eat plants from all of these communities but prefer the big sagebrush, grass, and desert shrub communities. The shrubs, grasses, and forbs of the area supply all roughage. However, during the winter months cottonseed oil meal is fed as a protein supplement. This is fed with trace mineralized salt in a 2:1 or 3:1 ratio.

The Area 18 range is classified as semi-arid. The annual precipitation varies from 4 to 12 inches and occurs mostly

during the fall and winter months. Rains are usually highly localized so the monthly precipitation may vary considerably from areas within Area 18. Snowfalls of up to one foot may occur during the winter, however, snow does not remain on the ground for over a week at a time. Temperatures are extreme. Seasonal fluctuations commonly vary between 10^{o}F and 100^{o}F.

Overgrazing is prevented by periodically changing the location of the watering tanks. The beef cattle are allowed to range at will, subject to the availability of water. As there is no permanent natural source of water in the area, water is trucked to the cattle from Well 8.

The beef herd is corralled five or six times each year. The animals are identified, weighed, inspected for disease conditions and treated if necessary. At each roundup they are sprayed with an insecticide for fly, lice, and tick control.

In 1964, a horse was purchased to aid in the roundups. However, because of the vast area and rough terrain of Area 18 grazing lands, occasionally groups of cattle have not been found. In this case the U. S. Air Force has flown helicopter flights in order to locate these animals. As a result, there have been only three animals in five years that have not been found.

On August 3, 1965, the entire breeding herd was tested for brucellosis, leptospirosis, and anaplasmosis. The results were negative.

B. Identification and Record System

An identification and record system was developed which insured that each animal is individually identified. A block of numbers from 500 through 999 was reserved for the beef herd. When an animal is born or purchased it is assigned the next chronological number. This number is permanently retired when the animal leaves the herd. The number is tattooed in the left ear, and a neck chain with a plastic numeral tag or brisket tag is attached to the animal.

As an aid to rapid identification from a distance, animals have been branded (both thermally and cryogenically) on the left hip. In addition to the identification numbers, each animal is heat branded with the letters "AEC" on the left rib cage. This brand is registered with the State of Nevada.

An individual file is established for each animal, and a record form was developed (see Appendix II) on which information as to date of birth, sire, dam, breedings, description, sicknesses, treatments, weights, disposition, etc., is recorded. In addition each file contains individual production records, pedigrees, brand inspection slips, necropsy protocol, and any other pertinent papers.

C. Reproduction and Production

The beef cows are pasture bred by two registered bulls. One is introduced into the herd around the 1st of June and the other around the 1st of July. They remain with the herd through August when they are returned to Well 3. Most of the calves are born between late March and May 1.

Each year a bull is sacrificed and a replacement bull is obtained by purchase or barter. Therefore, each bull remains in the herd for only two breeding seasons to minimize inbreeding.

This pasture method of breeding has worked well as the percentage of calves born from sexually mature animals was 73% in 1966, (only one bull in the herd during the season of 1965) 96% in 1967, 96% in 1968, and 96% in 1969. The average calving percentage for Southern Nevada is 59% as reported in a 1965 survey conducted by Leroy Rogers[3] of the University of Nevada. Most ranchers practice year around calving, i.e., the herd sires are in the herd all year.

During June, the baby calves are usually dehorned, castrated, identified with an ear tattoo, neck chain, or brisket tag. The calves are transported to Well 3 for weaning when they are 150-180 days old. The calves are maintained at Well 3 a month before they are are returned to the range. While there, they are branded with the AEC brand and are immunized against blackleg, malignant edema and shipping fever. The cryogenic identification brands are also applied at this time. The average weaning weight in 1967 was 392 pounds and in 1968 was 377 pounds. No weights are available for the earlier years. The average weaning weight of calves for the Southern Nevada area as reported by Mr. Rogers is 354 pounds.

D. Losses, Transfers, and Purchases

Herd losses from natural causes have been minimal. Three animals have disappeared without trace and the

bodies of three other animals have been found. Of these, one calf was killed by a motor vehicle and two aged animals died from undetermined causes. The latter were in advanced stages of decay when found so no necropsy was performed. In addition, four calves have died from tympanites while being weaned.

The high calving percentage and low death rate have resulted in a herd that is larger than is needed in order to supply the animals that are sacrificed each year. On two occasions the herd has been reduced by declaring certain animals surplus. The first time was on October 8, 1964, as previously stated. On August 17, 1967, another 40 animals were transferred to the University (Appendix III).

Before shipment, each animal underwent a complete physical examination, blood samples were drawn for complete cell count, and fecal and blood samples were collected for radioanalysis. A health certificate was issued for each animal and the brands were inspected. These records are kept on file for background information and possible use in case of inquiries and litigation.

The only purchases that have been made since 1964 have been for herd sires. A registered Hereford bull is obtained each year as shown in Table 1. These animals are either purchased or obtained in barter for excess animals.

Table 1. Herd Sires

Bull #	Date of Procurement	Source of Bull	Remarks	Date Sacrificed
508	22 April 65	U of Nevada at Reno	Purchased	30 May 67
509	29 August 65	U of Nevada at Reno	Purchased	19 October 67
510	29 June 67	Lee Livestock Company Elko, Nevada	Purchased	8 October 68

Table 1. Herd Sires cont'd

Bull #	Date of Procurement	Source of Bull	Remarks	Date Sacrificed
511	27 October 67	U of Nevada at Reno	Barter for six surplus dairy animals	In the herd
512	30 October 68	U of Nevada at Reno	Barter for surplus	In the herd

IV. HERD UTILIZATION

A. The Surveillance and Sacrifice Program

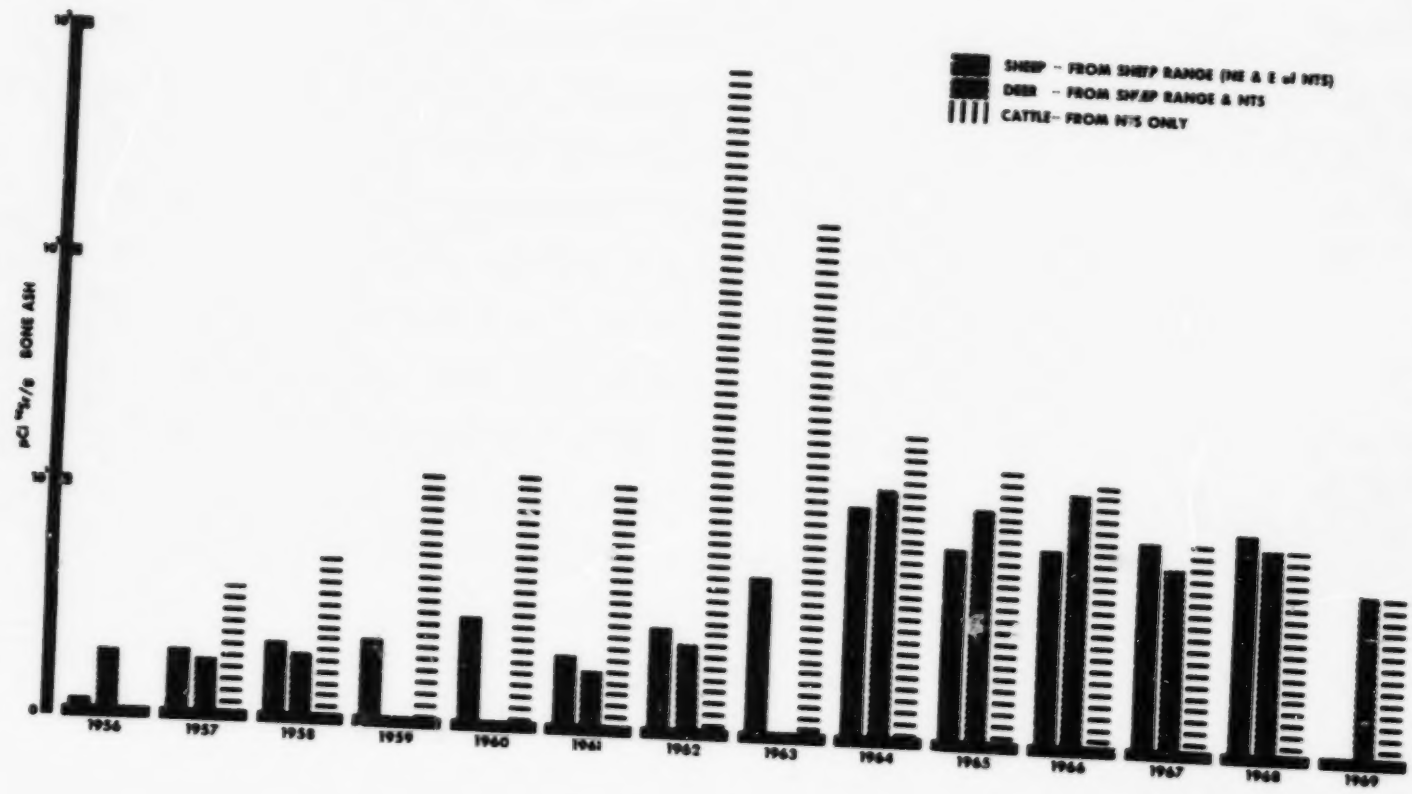
Area 18, until recent years, was used for atmospheric nuclear testing. Three detonation sites are within the herd's normal grazing pattern. These sites are: (1) Little Feller II, detonated July 7, 1962, (2) Johnny Boy, detonated July 11, 1962, and (3) Little Feller I, detonated July 17, 1962. Prior to 1962, numerous atmospheric tests were conducted around the periphery of the grazing area, primarily on the southern and western edges. The grazing area was also in the fallout pattern of Project Buggy, detonated March 12, 1968, and is frequently in the effluent pattern of the nuclear reactors tested at Jackass Flats. It is readily seen that this herd grazes in an area with a much higher probability of contamination as compared to off-site ranges.

Under present procedures, six animals (3 mature and 3 young) are sacrificed in May or June and again in October or November of each year. Appendix IV lists all sacrificed animals. Each sacrificed animal is necropsied and a detailed protocol is completed and placed in the permanent file. If any gross abnormalities are found they are noted. Tissue samples are collected, perserved, and prepared for histopathologic examination. Tissues sampled are heart, kidney, liver, lung, muscle, spleen, thyroid, eye, spinal cord, and any grossly abnormal tissue. Additional tissue samples are occasionally collected for special studies. These tissues are then examined by Board certified veterinary pathologists. To date no pathology has been reported that could be attributable to ionizing radiation.

In addition to the specimens collected for histopathological examination, selected samples are collected for radioanalysis. Samples include abomasum contents, abomasum tissue, femur, liver, lung tips, muscle, rumen contents, and thyroid. Additional samples are collected for special studies. Gamma spectroscopy is routinely ran for ^{40}K, ^{54}Mn, ^{85}Sr, ^{106}Ru, ^{131}I, ^{137}Cs, ^{140}Ba, and ^{144}Ce. In addition, radiochemistry is performed to determine levels of ^{90}Sr and occasionally ^{239}Pu.

The detailed analytical results of the samples collected at each sacrifice are reported in the progress reports published by the Animal Investigation Program at SWRHL.(4) In general, radioactivity levels have been at or near background, except for ^{131}I in samples collected immediately following a Plowshare cratering experiment or a foreign atmospheric test. Levels of the longer lived isotopes have had a downward trend since the cessation of atmospheric testing. Figure 1 shows a comparison of ^{90}Sr in three meat producing ruminants over the period 1956-1969.(5)

Figure 1. Comparison of ^{90}Sr in Bones of Bighorn Sheep, Deer, and Cattle



To date, the data collected indicate that the levels of external radiation and radionuclides in various tissues have not been high enough to affect the beef herd.

B. Special Studies

In addition to the beef herd, the SWRHL maintains five mature Hereford steers that have permanent rumen fistulas. These animals are placed on the beef range one day a month. At the end of the day, an ingesta sample is collected from each animal and the sample is analyzed for its radionuclide content, nutritional value, and botanical content. This information is used in determining the radionuclide uptake of the beef herd and in planning efficient range use.

In cooperation with the University of Nevada, at Reno, a forage intake and digestability study was conducted utilizing the fistulated steers. The study period covered one winter and two summers. The results of the study were presented in the Proceedings, Western Section, American Society of Animal Science.[6]

V. SUMMARY

The AEC beef herd has been maintained on the Area 18 range in a manner similar to that utilized by most area ranchers. Slightly better management has been practiced, i.e., water is supplied adjacent to the grazing area, grazing areas are rotated, an adequate number of bulls are provided during a concentrated breeding season, insect control measures are used, and protein supplement is provided in the winter time. This somewhat intensified management has resulted in near 100% calf crops and heavy weaning weights.

The periodic surveillance of the herd has revealed no adverse health, reproduction, or genetic effects resulting from the environment in which these animals live.

Of more scientific value are the data that have been compiled as to the concentrations of the various nuclides found in the selected tissues sampled and how they are related to the plant species ingested. These concentrations can often be traced to specific events or releases.

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3. Rogers, L. F. Characteristics of the range cattle industry in Nevada, Region I, Southern Nevada. Publication No. B5. Max C. Fleischmann College of Agriculture. University of Nevada. (September 1965)

4. Progress Report of the Animal Investigation Program - June 1, 1964 through December 31, 1965 - Part II - Routine Bovine Sampling Studies. BER-8. (December 28, 1967)

5. Annual Report for 1968 - Southwestern Radiological Health Laboratory.

6. Smith, T. M., A. L. Lesperance, V. R. Bohman, R. A. Brechbill, and K. W. Brown. Intake and digestability of forages grazed by cattle on a Southern Nevada range. Proceedings, Western Section, American Society of Animal Science. Vol 19. (1968)

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APPENDIX I. Census of beef herd - May 22, 1969

Animal No.	Year of Birth	Weight (kg)	Breed	1969 Calf #
Nineteen (19) cows four years old and older				
548	1962	362	Hereford	Calf not matched
549	1963	356	Hereford	703
550	1964	373	Hereford	681
554	1962	383	Hereford	Calf not matched
557	1964	326	Hereford	688
564	1961	324	Hereford	685
566	1961	319	Hereford	699
567	1963	328	Hereford	682
571	1957	482	Hereford	692
572	1964	398	Hereford	Calf not matched
574	1957	350	Hereford	707
575	1963	339	Hereford	Calf not matched
580	1964	266	Hereford	Calf not matched
583	1964	346	Hereford	691
587	1964	386	Hereford	690
590	1964	301	Hereford	Calf not matched
593	1965	346	Hereford	697
595	1965	444	Hereford	689
596	1965	344	Hereford	698
Seven (7) 3-year-old cows				
602	1966	286	Hereford	686
604	1966	313	Hereford	696
607	1966	290	Hereford	Calf not matched
609	1966	333	Hereford	Calf not matched
612	1966	277	Hereford	Calf not matched
614	1966	377	Hereford	687
618	1966	328	Hereford	693

APPENDIX I. Census of beef herd - May 22, 1969 cont'd

Animal No.	Year of Birth	Weight (kg)	Breed	1969 Calf #
Seven (7) 2-year-old heifers				
629	1967	317	Hereford	705
636	1967	326	Hereford	683
638	1967	281	Hereford	Calf not matched
640	1967	329	Hereford	Calf not matched
645	1967	319	Hereford	Calf not matched
647	1967	275	Hereford	Calf not matched
648	1967	342	Hereford	Calf not matched
Two (2) 3-year-old steers				
603	1966	434	Hereford	
615	1966	362	Hereford	
Six (6) 2-year-old steers				
628	1967	402	Hereford	
631	1967	364	Hereford	
635	1967	421	Hereford	
639	1967	408	Hereford	
644	1967	375	Hereford	
111	1967	379	Hereford-Holstein Cross	
Twelve (12) yearling heifers				
650	1968	212	Hereford	
651	1968	230	Hereford	
654	1968	212	Hereford	
655	1968	179	Hereford	
660	1968	250	Hereford	
661	1968	217	Hereford	
663	1968	243	Hereford	
664	1968	192	Hereford	

APPENDIX I. Census of beef herd - May 22, 1969 cont'd

Animal No.	Year of Birth	Weight (kg)	Breed	1969 Calf #
666	1968	210	Hereford	
668	1968	208	Hereford	
670	1968	217	Hereford	
671	1968	217	Hereford	
Fourteen (14) yearling steers				
649	1968	254	Hereford	
653	1968	268	Hereford	
656	1968	174	Hereford	
657	1968	196	Hereford	
658	1968	212	Hereford	
659	1968	203	Hereford	
662	1968	217	Hereford	
667	1968	Observed but not corralled		
669	1968	192	Hereford	
673	1968	217	Hereford	
674	1968	252	Hereford	
675	1968	228	Hereford	
676	1968	221	Hereford	
677	1968	201	Hereford	
Thirteen (13) 1969 heifer calves				
679	1969	77	Hereford	
682	1969	52	Hereford	
684	1969	38	Hereford	
692	1969	102	Hereford	
693	1969	61	Hereford	
694	1969	89	Hereford	
695	1969	71	Hereford	
698	1969	75	Hereford	

APPENDIX I. Census of beef herd - May 22, 1969 cont'd

Animal No.	Year of Birth	Weight (kg)	Breed	Remarks
699	1969	96	Hereford	
703	1969	89	Hereford	
706	1969	67	Hereford	
708	1969	73	Hereford	Tattooed 807
710	1969	39	Hereford	
Nineteen (19) 1969 steer calves				
680	1969	77	Hereford	
681	1969	94	Hereford	
683	1969	78	Hereford	
685	1969	89	Hereford	
686	1969	70	Hereford	
687	1969	67	Hereford	
688	1969	73	Hereford	
689	1969	67	Hereford	
690	1969	55	Hereford	
691	1969	61	Hereford	
696	1969	58	Hereford	
697	1969	69	Hereford	
700	1969	57	Hereford	
701	1969	67	Hereford	
702	1961	79	Hereford	
704	1969	63	Hereford	
705	1969	74	Hereford	
707	1969	50	Hereford	
709	1969	69	Hereford	

APPENDIX I. Census of beef herd - May 22, 1969 cont'd

Animal No.	Year of Birth	Weight (kg)	Breed	Remarks
Two (2) breeding bulls				
511	11 Mar 64	Not weighed	Registered Hereford	
512	17 Mar 65	Not weighed	Registered Hereford	

The following animals were not observed at this roundup:

558 - 6-year-old cow - last seen June 1968.

625 - 2-year-old heifer - last seen June 1968.

672 - 1-year-old steer - on range November 7, 1968.

In addition 610, a 3-year-old cow, has not been observed for nearly two years so it is presumed to be dead.

APPENDIX II. INDIVIDUAL LIFE RECORD
USPHS BEEF HERD

I.D.NO. 569 (22)

SEX Female

DATE OF BIRTH Spring 1957

DAM'S I.D.NO. Unknown

SIRE'S I.D.NO. Unknown

Special Markings, Brands, Tatoos, etc.
Left ear tag 69. Right ear tattoo. AIU 69
Branded AEC left rib, 69 left hip, 9 left face
Horns straight forward. Original brand illegible

Individual Weight Record				
Date	Age	Weight	Condition	Remarks
2 Jun 65	8 yrs	1100	Good	
28 Oct 65		968	Good	
27 Oct 66		985	Good	
26 May 66	9 yrs	1050	Good	
21 Jul 66		1035		
12 Oct 66		1065		
31 May 67		850	Good	
5 Jun 69		1077	Extra Good	

BREEDING AND PRODUCE RECORD 8 October 1968 - 981

Breeding Date and Bull used				Birth Date of calf	Sex of calf	I.D.NO. of calf	Birth wt.	Weaning Data					Remarks
Date	Bull	Date	Bull					Date	Wt.	Age in days	Daily gain	Adj.wt.	
				29 Dec 64	Male	591	70						
				3 May 66	Female	610	80						
				28 Mar 67	Female	636	80						
				3 May 68	Male	649	72						

Disposition of Animal: Sacrificed 9 October 1968

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MANAGEMENT AND TREATMENT RECORDS
(Give details and dates)

I.D. Numbers			AEC Brand	Dehorning	Castration	Vaccinations	Miscellaneous treatments and surgery
Brand	Tattoo	Neck Chain					
69 1/26/65	69 11/6/64	7/1/65 569	Rebranded 26 Jan 65			Blackleg 14 Apr 60	Cryogenic brand/Liquid nitrogen
							Tail Biopsy - 12 October 1966

Remarks (Include dates of sightings, condition, location, all other pertinent data):

Wintered at corrals - Well 3 - September 1964 - 7 February 1965 - when moved to Area 18

Through chute 2 June 1965 - Sprayed

Through chute 29 July 1965 - Sprayed. Bled - Negative, Brucellosis, Anaplasmosis, Leptospirosis

Through chute 16 September 1965 - Sprayed. Kemtox 1% Solution

Chute - 28 October 1965 - Keraspray. Pregnant.

Chute - 26 May 1966 p Keraspray 1%: Moved to new location near Flivver Site

Chute - Well 8 - Kemtox 1% Solution. 21 July 1966

Chute - Well 8 - Kemtox 1% Solution. 31 May 1967

8 Aug 1967 - Through chute, Kemtox

18 Oct 1967 - 1030 lbs. Beginning cancer - right eye. Nevada neck tag

Gathered and bled. Turned loose 5 March 1968

5 June 1968 - Well 8 Chute - Kemtox 1% Solution

8 October 1968 - Chute scales - Area 18 and hauled to Well 3 - Slaughtered on 9 October

APPENDIX III. Surplus animals transferred to University of Nevada

Animals transferred on October 8, 1964

Thirteen (13) mature cows

No. 20	Hereford
No. 51	Hereford
No. 43	Hereford
No. 6	Holstein
No. 9	Hereford
No I.D. #	Hereford
No. 83	Hereford
No. 53	Hereford
No. 32	Hereford
No. 13	Hereford
No I.D. #	Hereford
No. 3	Holstein
No. 49	Holstein

Five (5) 2-year-old heifers

No I.D. #	Hereford
No. 114	Hereford
No I.D. #	Hereford
No. 121	Hereford
No I.D. #	Hereford

One (1) 2-year-old steer

No. 127	Hereford

Four (4) yearling steers

No. 113	Hereford
No I.D. #	Hereford
No I.D. #	Hereford
No I.D. #	Hereford

Four (4) yearling females

88 AGS 8806	Guernsey
88 ADD 7732	Holstein
No I.D. #	Hereford
No I.D. #	Hereford

Seven (7) 1964 female calves

No I.D. #	Hereford
No I.D. #	Hereford
No I.D. #	Angus
No I.D. #	Angus
No I.D. #	Hereford
No I.D. #	Hereford
No I.D. #	Hereford

Seven (7) 1964 male calves

No. 115	Holstein-Angus
No. 27	Hereford
No I.D. #	Angus
No I.D. #	Hereford
No I.D. #	Hereford
No I.D. #	Angus
No I.D. #	Hereford

Three (3) bulls

No. 117	Hereford
No. 169	Hereford
No. 143	Hereford

These animals were shipped before institution of FSS Identification and Record System.

APPENDIX III. Surplus animals transferred to University of Nevada cont'd

Animals transferred on August 17, 1967

Two (2) 3-year-old cows

No. 581 Angus-Holstein
No. 582 Angus-Holstein

Three (3) 2-year-old heifers

No. 41 Hereford-Holstein
No. 51 Hereford-Holstein
No. 53 Hereford-Holstein

Three (3) 2-year-old steers

No. 50 Hereford-Holstein
No. 54 Hereford-Holstein
No. 57 Holstein

Twelve (12) yearling steers

No. 59 Hereford-Holstein
No. 60 Hereford-Holstein
No. 61 Holstein
No. 63 Hereford-Holstein
No. 64 Hereford-Holstein
No. 65 Hereford-Holstein
No. 68 Hereford-Holstein
No. 69 Hereford-Holstein
No. 72 Hereford-Holstein
No. 74 Hereford-Holstein
No. 76 Hereford-Holstein
No. 78 Hereford-Holstein

Seven (7) yearling females

No. 58 Hereford-Holstein
No. 67 Hereford-Holstein
No. 73 Hereford-Holstein
No. 75 Hereford-Holstein
No. 81 Hereford-Holstein
No. 82 Hereford-Holstein
No. 601 Hereford-Holstein

Four (4) 1967 female calves

No. 100 Hereford-Holstein
No. 619 Hereford-Holstein
No. 620 Hereford-Holstein
No. 621 Hereford-Holstein

Seven (7) 1967 male calves

No. 91 Hereford-Holstein
No. 101 Hereford-Holstein
No. 102 Hereford-Holstein
No. 103 Holstein
No. 626 Hereford-Holstein-Angus
No. 632 Hereford-Holstein-Angus
No. 646 Hereford-Holstein

Two (2) aged Holstein cows

No. 15
No. 25

APPENDIX IV. List of animals sacrificed for Animal Investigation Program

Animal No.	Age	Weight (kg)	Sex	Breed	Date Sacrificed	AIP Sample No.
49	12 yrs		Cow	Hereford	10 Jun 64	B-227-64
74	4 yrs		Steer	Hereford	10 Jun 64	B-229-64
109	1-1/2 yrs	227	Steer	Hereford	10 Jun 64	B-230-64
8	12 yrs	364	Cow	Hereford	10 Jun 64	B-228-64
122	1 yr		Steer	Hereford	10 Jun 64	B-231-64
No I.D.	3 mos		Steer	Hereford	10 Jun 64	B-232-64
105	4-1/2 yrs	295	Steer	Hereford	30 Jun 64	BOV-1-NTS-64
44	10 yrs	409	Cow	Hereford	30 Jun 64	BOV-2-NTS-64
46	10 yrs	364	Cow	Hereford	30 Jun 64	BOV-3-NTS-64
102	2 yrs		Steer	Hereford	30 Jun 64	BOV-4-NTS-64
147	1 yr	273	Steer	Hereford	30 Jun 64	BOV-5-NTS-64
107	1-1/2 yrs	364	Steer	Hereford	30 Jun 64	BOV-6-NTS-64
No I.D.	7 yrs	523	Cow	Hereford	7 Oct 64	BOV-7-NTS-64
No I.D.	7 yrs	432	Cow	Hol-Her Cross	7 Oct 64	BOV-8-NTS-64
No I.D.	7 yrs	477	Cow	Hol-Her Cross	7 Oct 64	BOV-9-NTS-64
No I.D.	2-1/2 yrs	205	Steer	Hereford	7 Oct 64	BOV-10-NTS-64
No I.D.	1-1/2 yrs	227	Steer	Hereford	7 Oct 64	BOV-11-NTS-64
No I.D.	1 yr	148	Bull	Hereford	7 Oct 64	BOV-12-NTS-64

All the above animals were sacrificed prior to institution of the FSS Identification and Record System.

APPENDIX IV. List of animals sacrificed for Animal Investigation Program cont'd

Animal No.	Age	Weight (kg)	Sex	Breed	Date Sacrificed	AIP Sample No.
505	10 yrs	528	Cow	Brahman	3 Jun 65	BOV-1-NTS-65
506	15 yrs	395	Cow	Brahman	3 Jun 65	BOV-2-NTS-65
507	7 yrs	465	Cow	Brahman	3 Jun 65	BOV-3-NTS-65
560	2 yrs	204	Heifer	Hereford	3 Jun 65	BOV-4-NTS-65
577	1 yr	204	Steer	Hereford	3 Jun 65	BOV-5-NTS-65
578	1 yr	193	Steer	Hereford	3 Jun 65	BOV-6-NTS-65
591	1 yr	221	Steer	Hereford	5 Nov 65	BOV-7-NTS-65
589	1 yr 2 mos	183	Steer	Hereford	5 Nov 65	BOV-8-NTS-65
556	5 yrs	432	Cow	Hereford	5 Nov 65	BOV-9-NTS-65
563	10 yrs	412	Cow	Hereford	5 Nov 65	BOV-10-NTS-65
592	1 yr	270	Steer	Hereford	5 Nov 65	BOV-11-NTS-65
565	7 yrs	322	Cow	Hereford	5 Nov 65	BOV-12-NTS-65
555	10 yrs	458	Cow	Hereford	26 May 66	BOV-1-NTS-66
576	2 yrs	364	Steer	Hereford	26 May 66	BOV-2-NTS-66
562	5 yrs	436	Cow	Hereford	26 May 66	BOV-3-NTS-66
559	3 yrs	428	Cow	Hereford	26 May 66	BOV-4-NTS-66
551	1-1/2 yrs	296	Steer	Hereford	26 May 66	BOV-5-NTS-66

APPENDIX IV. List of animals sacrificed for Animal Investigation Program cont'd

Animal No.	Age	Weight (kg)	Sex	Breed	Date Sacrificed	AIP Sample No.
546	2 yrs	364	Steer	Hereford	26 May 66	BOV-6-NTS-66
23	11 yrs	548	Cow	Holstein	13 Oct 66	BOV-9-NTS-66
22	8 yrs	510	Cow	Holstein	13 Oct 66	BOV-10-NTS-66
34	1-1/2 yrs	480	Steer	Hol-Her Cross	13 Oct 66	BOV-11-NTS-66
40	1-1/2 yrs	386	Steer	Hol-Her Cross	13 Oct 66	BOV-12-NTS-66
588	2 yrs	398	Cow	Hereford	13 Oct 66	BOV-13-NTS-66
579	10 yrs	503	Cow	Hereford	13 Oct 66	BOV-14-NTS-66
49	2 yrs	318	Cow	Holstein	1 Jun 67	BOV-1-NTS-67
584	2 yrs	364	Steer	Hereford	1 Jun 67	BOV-2-NTS-67
42	2 yrs	377	Steer	Holstein	1 Jun 67	BOV-3-NTS-67
586	2 yrs	320	Steer	Hereford	1 Jun 67	BOV-4-NTS-67
561	3 yrs	320	Cow	Hereford	1 Jun 67	BOV-5-NTS-67
508	5 yrs	652	Bull	Hereford	1 Jun 67	BOV-6-NTS-67
80	1 yr	336	Steer	Hol-Her Cross	19 Oct 67	BOV-7-NTS-67
509	5 yrs	719	Bull	Hereford	19 Oct 67	BOV-8-NTS-67
600	1-1/2 yrs	393	Steer	Hereford	19 Oct 67	BOV-9-NTS-67
616	1-1/2 yrs	361	Steer	Hereford	19 Oct 67	BOV-10-NTS-67
568	10-1/2 yrs	464	Cow	Hereford	19 Oct 67	BOV-11-NTS-67

APPENDIX IV. List of animals sacrificed for Animal Investigation Program

Animal No.	Age	Weight (kg)	Sex	Breed	Date Sacrificed	AIP Sample No.
573	9 yrs	430	Cow	Hereford	19 Oct 67	BOV-12-NTS-67
553	13 yrs	464	Cow	Hereford	11 Jun 68	BOV-1-NTS-68
606	2 yrs	407	Steer	Hereford	11 Jun 68	BOV-2-NTS-68
611	2 yrs	445	Steer	Hereford	11 Jun 68	BOV-3-NTS-68
599	2 yrs	424	Steer	Hereford	11 Jun 68	BOV-4-NTS-68
598	2 yrs	441	Steer	Hereford	11 Jun 88	BOV-5-NTS-68
643	13 mos	278	Steer	Hereford	11 Jun 68	BOV-6-NTS-68
630	1-1/2 yrs	375	Steer	Hereford	9 Oct 68	BOV-7-NTS-68
510	4 yrs	361	Bull	Hereford	9 Oct 68	BOV-8-NTS-68
569	11-1/2 yrs	490	Cow	Hereford	9 Oct 68	BOV-9-NTS-68
634	1-1/2 yrs	434	Steer	Hereford	9 Oct 68	BOV-10-NTS-68
624	1-1/2 yrs	339	Steer	Hereford	9 Oct 68	BOV-11-NTS-68
597	3 yrs	389	Cow	Hereford	9 Oct 68	BOV-12-NTS-68
617	3 yrs	377	Steer	Hereford	7 May 69	BOV-1-NTS-69
608	3 yrs	432	Steer	Hereford	7 May 69	BOV-2-NTS-69
627	2 yrs	323	Steer	Hereford	7 May 69	BOV-3-NTS-69
637	2 yrs	422	Steer	Hereford	7 May 69	BOV-4-NTS-69
678	1 mo	57	Bull	Hereford	7 May 69	BOV-5-NTS-69
570	10 yrs	384	Cow	Hereford	7 May 69	BOV-6-NTS-69